Red Hill, New Mexico monogenetic volcanic field: Variations in vent morphology

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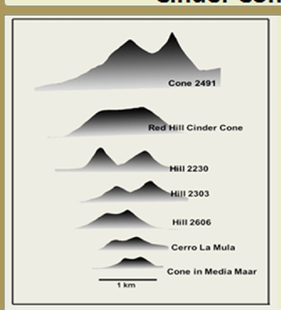
Summary

Located in Catron County on the western border of New Mexico, the Red Hill volcanic field lies on the western edge of the state along the Jemez structural alignment. Quaternary and Tertiary lava flows rest on Cretaceous strata. Quaternary faulting produces N 28° E trending scarps and provided pathways for ascending gases and magmas. Quaternary volcanism produced a mix of land forms including maars, cinder cones, cinder mounds, rimless depressions, and lava flows interspersed between older basalt-capped mesas. Twenty-two vents are identified as cinder cones or cinder mounds . Fifteen are identified as maars or alterations of maars which range from nearly 2.0-0.50 km in diameter. Most maar craters are surrounded by raised rims composed of loosely consolidated, volcaniclastic materials (base surge and air fall). Some maars contain inter-crater cinder cones or cinder mounds.

Location

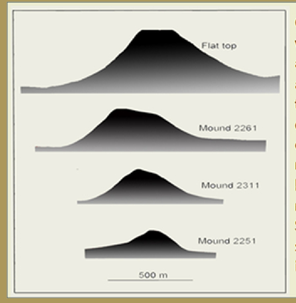
The Red Hill volcanic Field is located on the extreme western edge of New Mexico along the Jemez structural trend that includes Mt. Taylor, Valles Grande, and the Raton volcanic filed. Locally, the Red Hill field is located between the Taylor volcanic field to the west in Arizonan and the Bandera volcanic field to the northeast

Cinder Cones



Cinder cone built of loose basaltic lapilli have basal diameters range from 100 m to 1 km. Cone heights range 700 - 1000m. Maximum outer slopes are 31^0. Breached cones are associated with lava flows. Flows average 10 m thick, but some reach 30 m.

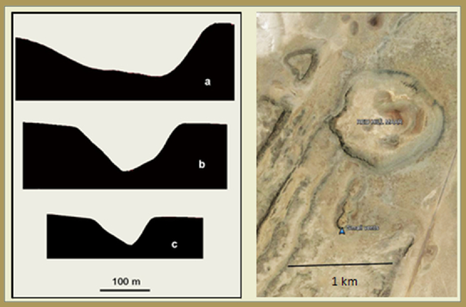
Cinder Mounds



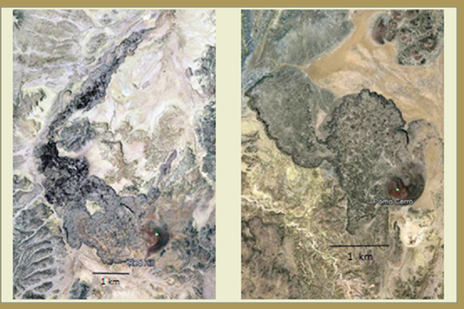
Cinder mounds are volcanic cones without apical craters. Mounds are generally smaller than the better-developed cinder cones. Basal diameters range from 100 m to 1 km, and mound heights range up to 200 m. Small mounds are shown on next illustration.

Red Hill, Pasto, and Compuesto Maars

Small Vents



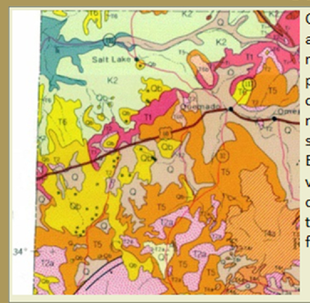
Lava Flows



Thick flow in depression and buried cone

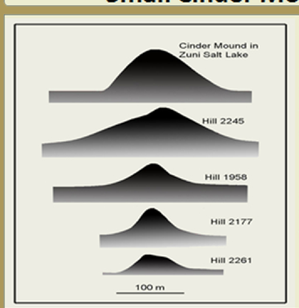
Young Quaternary basalt adjacent to older basalt capped mesa. Eruption in a topographic low next to the mesa produced a thick lava flow (65-100 m) that nearly buried its source vent.

Area Geology



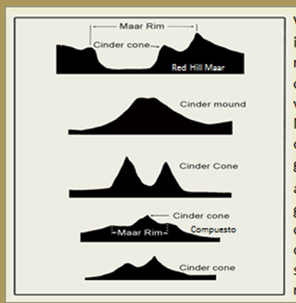
Quaternary basalts and volcaniclastic materials are super-posed on and around older Tertiary volcanic rocks and Cretaceous sediments. Emplacement of volcanic structures is controlled by NNE trending normal faulting.

Small Cinder Mounds



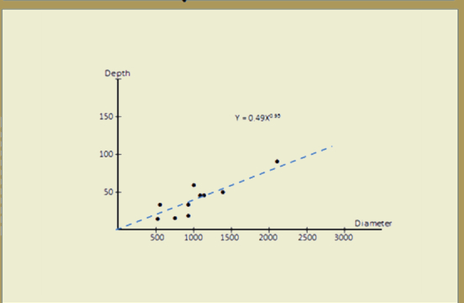
Small cinder mounds occur as individual vents and on the interior of some of the maars. Basal diameters are on the order of a hundred meters and elevations are 10-30 meters. At the Compuesto maar the internal cone grew to completely fill the crater.

Variations



Volcanic vents are found in a wide range of morphologies depending on eruptive activity and volumes of materials. Maar and smaller pit craters are formed by gas-charged eruptions as magma encounters ground water. Cinder cones and mounds build constructional cone with slopes at the angle of repose.

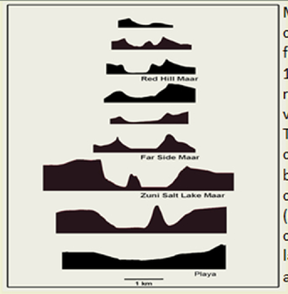
Maar Depth vs. Diameter



Imagery

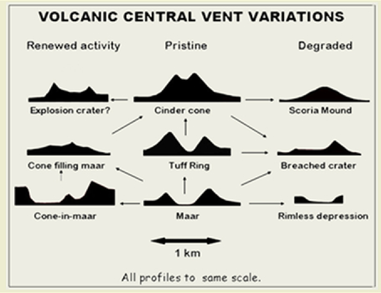
Quaternary volcanic features (cones, maar, and flows) are interspersed among older basalt capped mesas. Lava flow at Red Hill cone follows pre-existing drainage trends. Young cinder cones and older basalt capped mesas provide most of the relief in the area. Stars are maar craters.

Maars and Pits



Maars and suspected crater-form vents range from 2 km to as small as 100 m diameter. Most retain a raised rim of volcaniclastic materials. Three of the maars have cinder cones or mounds built on the floor of the craters. One maar (Compuesto) is completely filled by later cinder cone activity.

Variations



Selected References

Chamberlin, R.M., Steven M. Cather, Orin J. Anderson, and Glen E. Jones, 1994. *Reconnaissance Geologic Map of the Quemado 30 x 60 Minute Quadrangle, Catron County, New Mexico*, N.M. Bureau of Mines and Mineral Res. Open-file Report 406.

Crumpler, L. S., and J. C. Aubele, 1990, *Red Hill volcanic field, New Mexico*, in Wood, C. A., and Kienle, J. (eds), Volcanoes of North America: Cambridge University Press, Cambridge, p. 307-308.

Cummings, D., 1968, *Geologic map of the Zuni Salt Lake volcanic crater, Catron County, New Mexico*, U. S. Geol. Surv. Misc. Geologic Inves. Map I-544, scale 1:6,000.

Dunbar N.W., 2005, *Quaternary Volcanism in New Mexico*, N.M. Museum Natl. Hist. Sci., Bull. 28, 95-106.

Hoffer, J. M., and Corbitt, L. L., 1989, *A preliminary note on some unusual explosion-collapse craters, Quemado basalt field, Catron County, New Mexico*, N.M. Geol. Soc., 40th Field Conf. Guidebook, p. 157-158.

McIntosh, W. C., and Cather, S. M., 1994, *40Ar/39Ar geochronology of basaltic rocks and constraints on Late Cenozoic stratigraphy and landscape development in the Red Hill-Quemado area, New Mexico*, New Mexico Geol. Soc. 45th Field Conf. Guidebook, p. 209-224.

Willard, M.E., 1959, *Tertiary stratigraphy of northern Carton Co., New Mexico*, N.M. Geol. Soc. 10th Field Conf. Guidebook, 92-99.